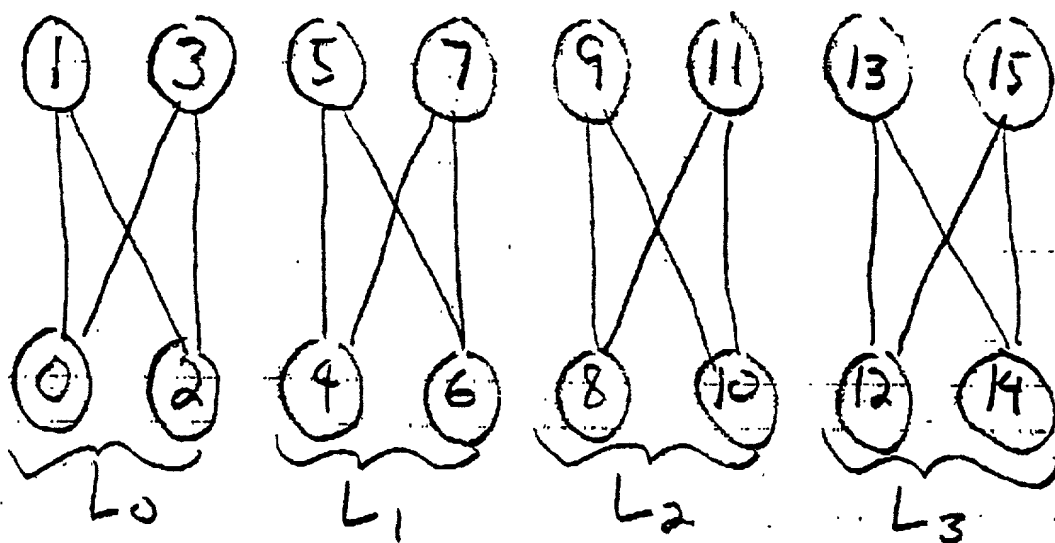


Figure 1a



Core ring links

Figure 1b

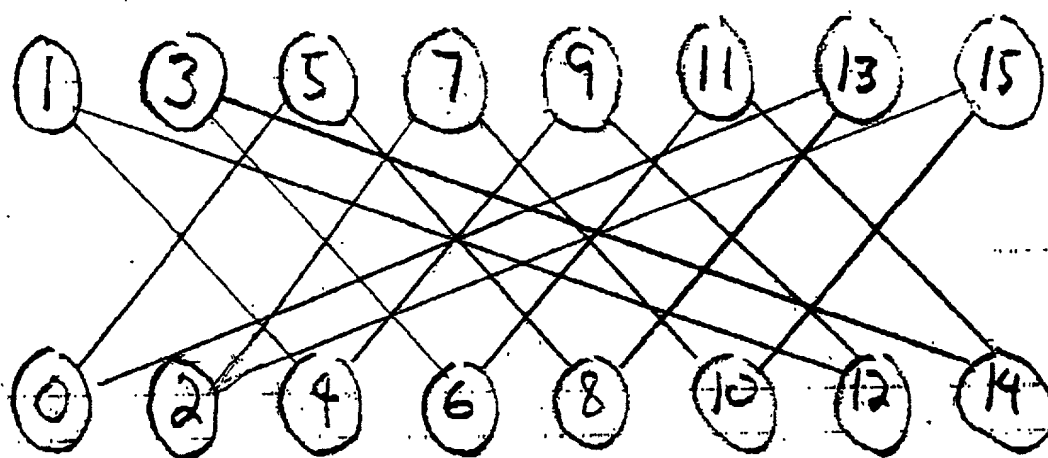
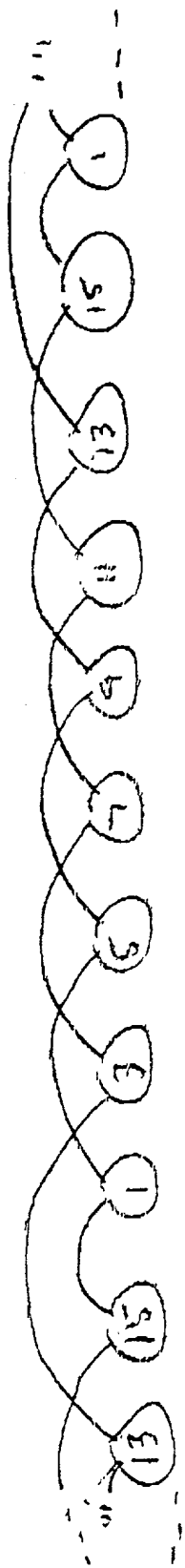
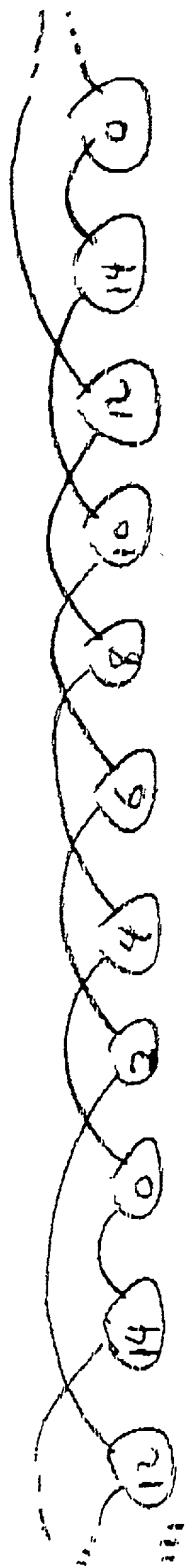


Figure 1C Parallel spanning links



I-ring



O-ring

Figure 1(d)

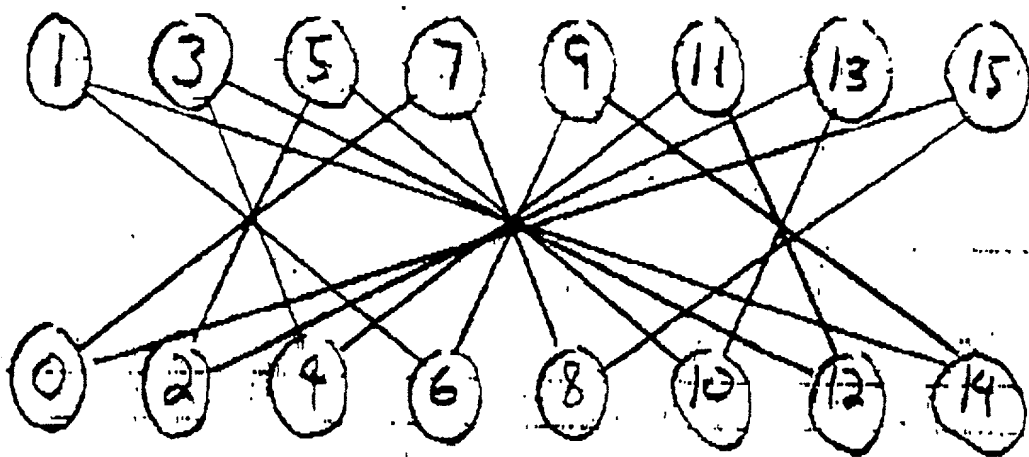


Figure 2: Twisted spanning links

Same core ring links as Figure 1

Same I-ring and O-ring links as Figure 1

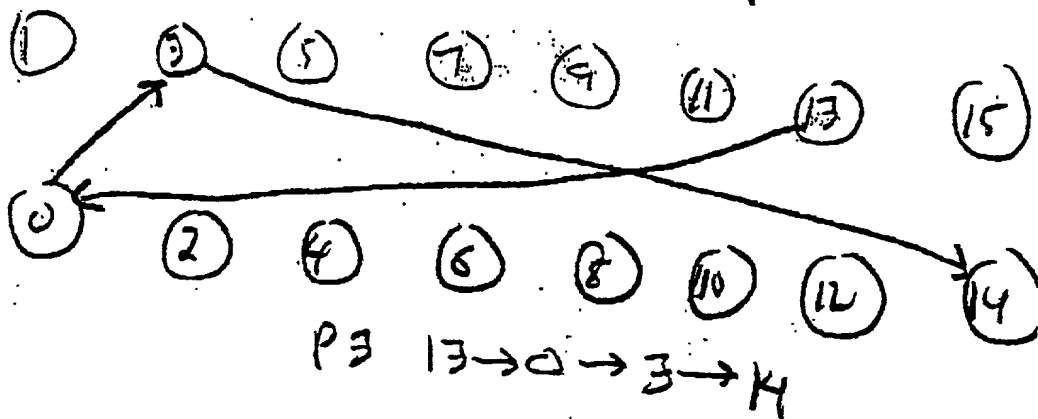
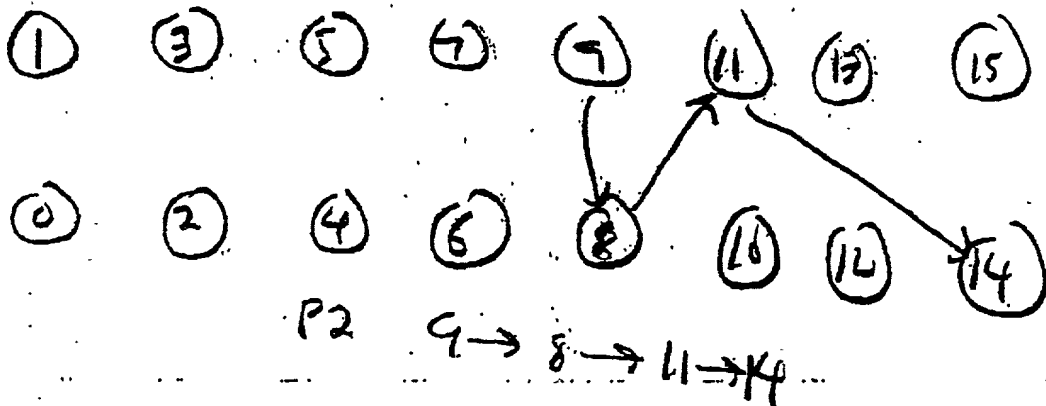
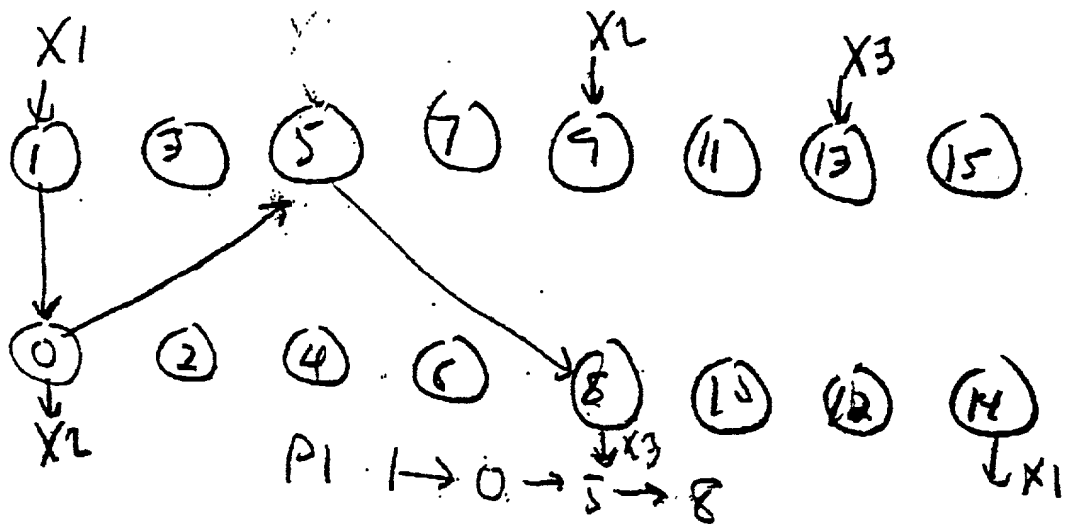


Figure 3

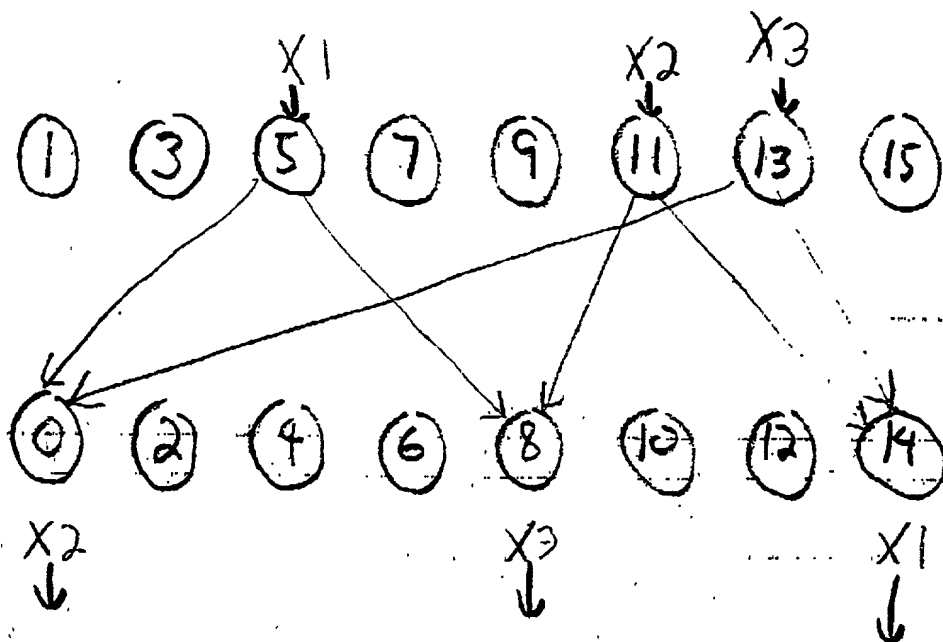


Figure 4 (b)

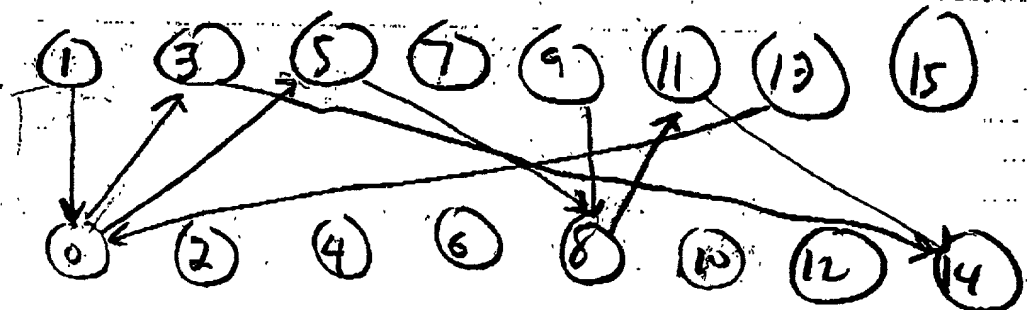
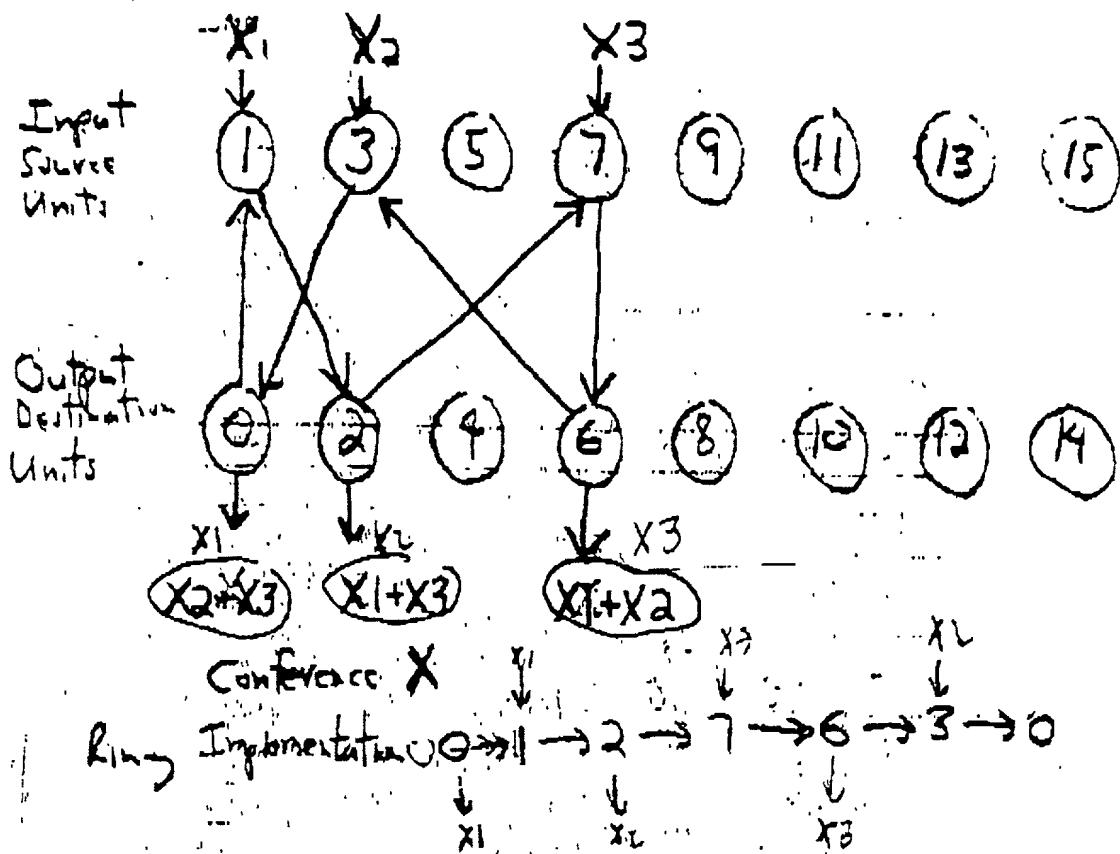
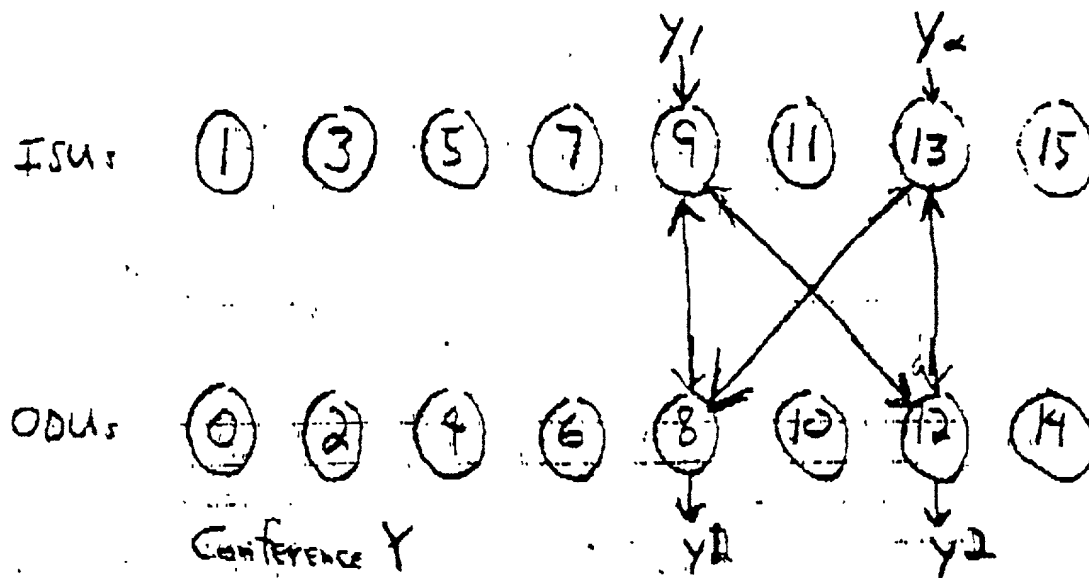


Figure 4(a)



3 party

Figure 5 (a)



Ring Implementation $8 \rightarrow 9 \rightarrow 12 \rightarrow 13 \rightarrow 8$

Figure 5 (b) 2 parts

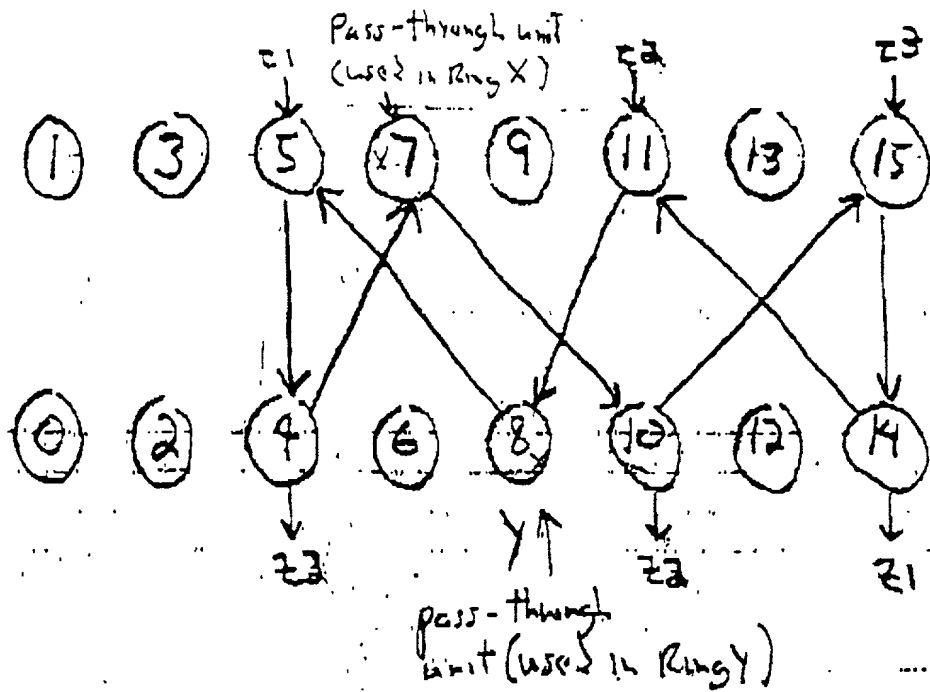
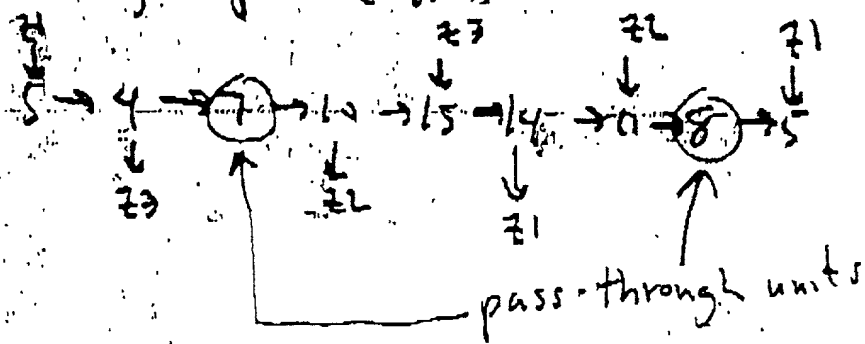
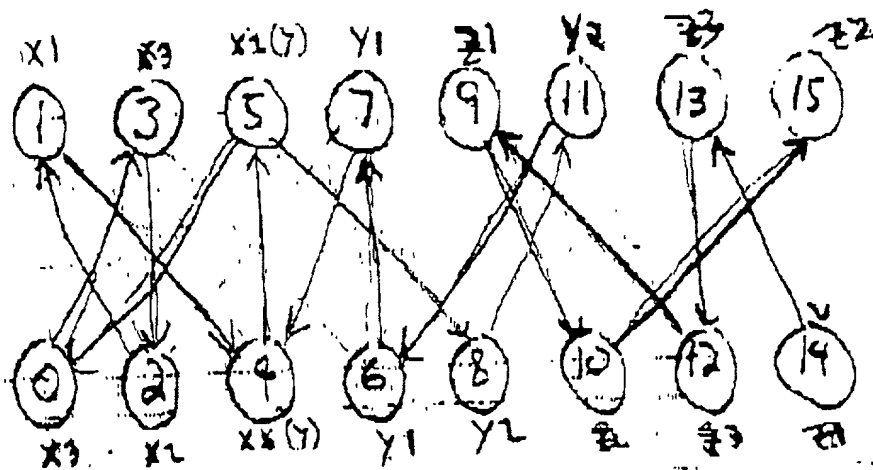


Figure 5 (c)
 Reference Z
 Ring Implementation





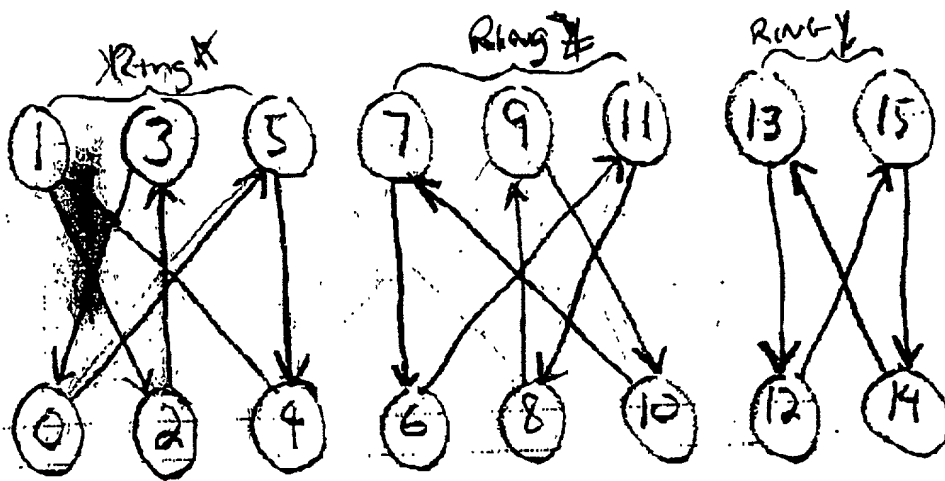
Ring X: $1 \rightarrow 4 \rightarrow 5 \rightarrow 0 \rightarrow 3 \rightarrow 2 \rightarrow 1$

Ring Y: $7 \rightarrow 4 \rightarrow 5 \rightarrow 8 \rightarrow 11 \rightarrow 6 \rightarrow 7$

Ring Z: $9 \rightarrow 10 \rightarrow 15 \rightarrow 14 \rightarrow 13 \rightarrow 12 \rightarrow 9$

link $5 \rightarrow 4$ is a pass-through-unit for conf Y
nodes $5 \rightarrow 4$ are pass-through nodes for conf Y

Figure 6



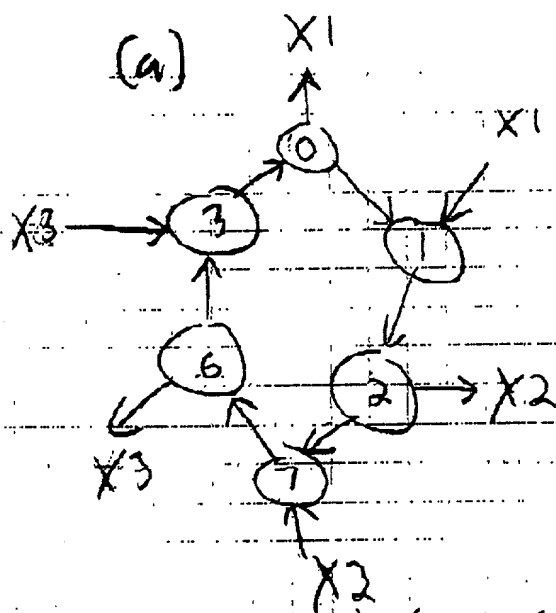
(3, 3, 2) - conf. Disjoint Implementation

X: $1 \rightarrow 2 \rightarrow 3 \rightarrow 0 \rightarrow 5 \rightarrow 4 \rightarrow 1$

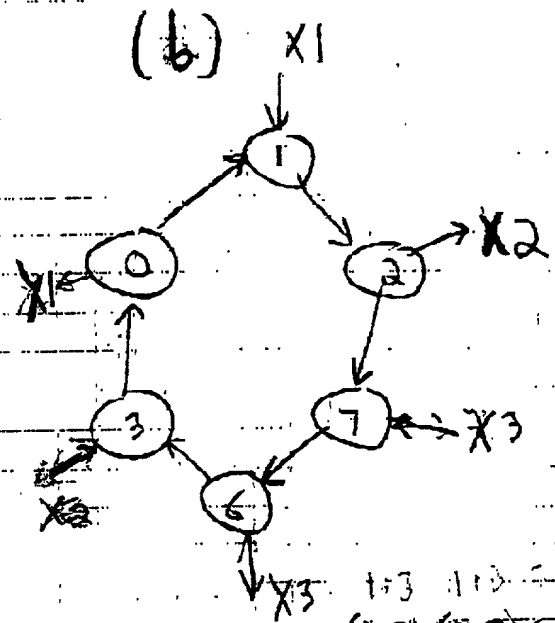
Z: $11 \rightarrow 8 \rightarrow 9 \rightarrow 10 \rightarrow 7 \rightarrow 6 \rightarrow 11$

Y: $13 \rightarrow 12 \rightarrow 15 \rightarrow 14 \rightarrow 13$

Figure 7

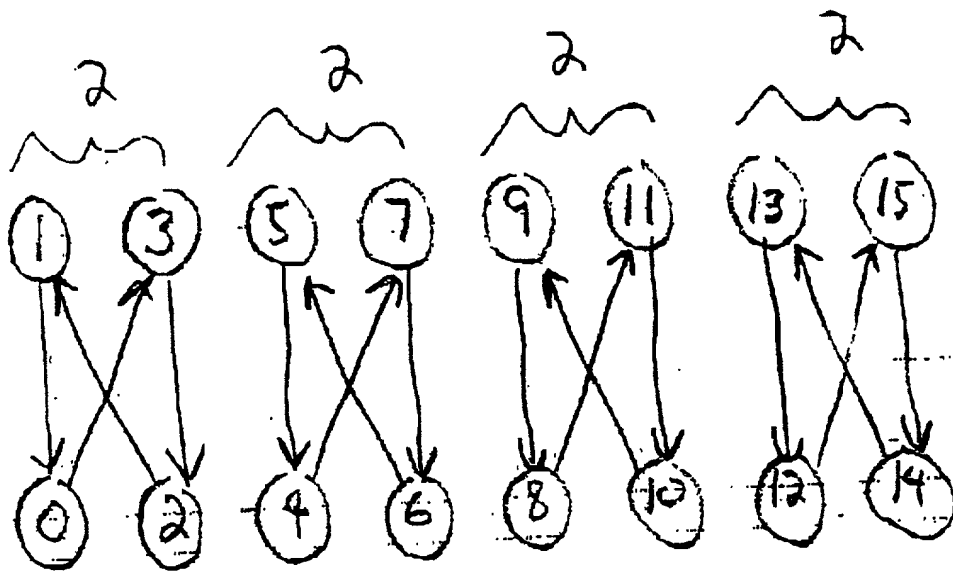


$$ALND = \frac{(6+3) + (1+3) + (1+3)}{6} = 2$$

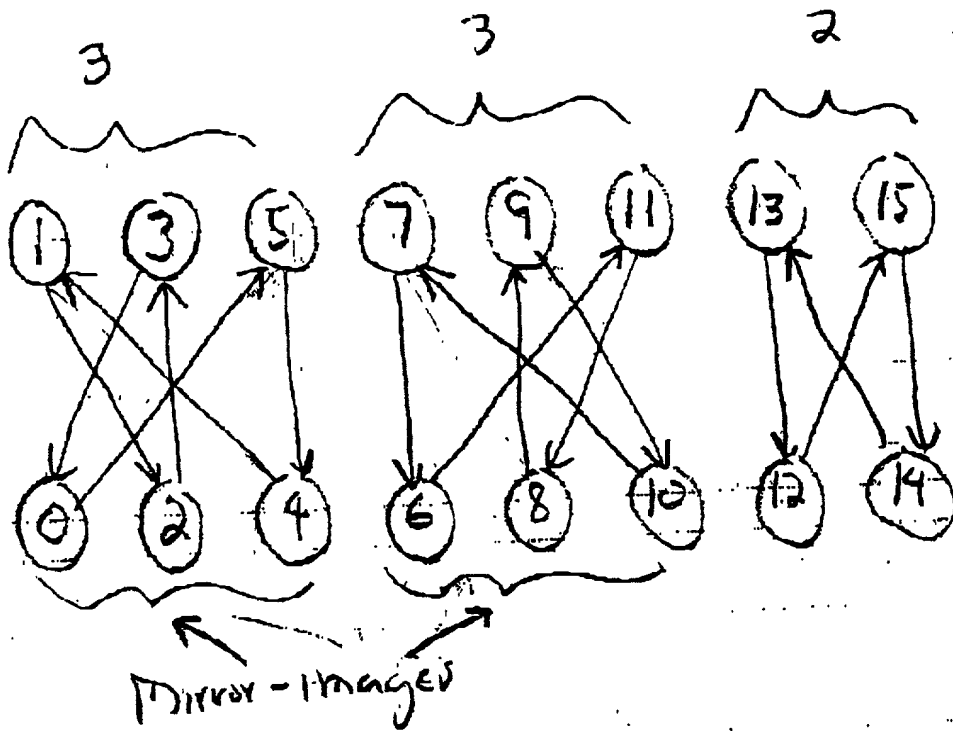


$$ALND = \frac{(1+3) + (1+3) + (3+3)}{6} = \frac{18}{6} = 3$$

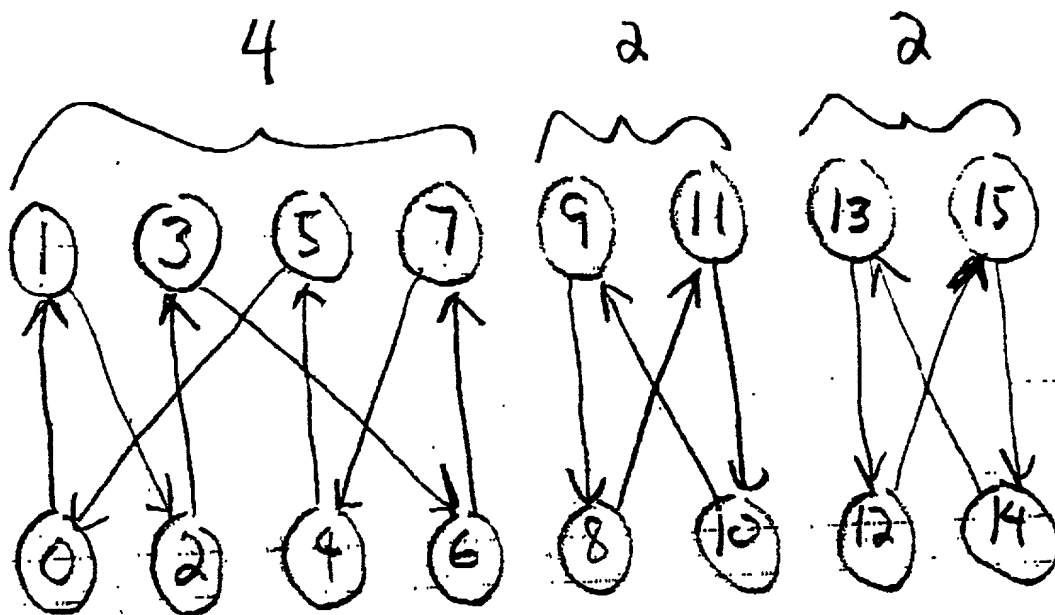
Figure 8



$(2, 2, 2, 2)$ - disjoint
Fig 9(a)

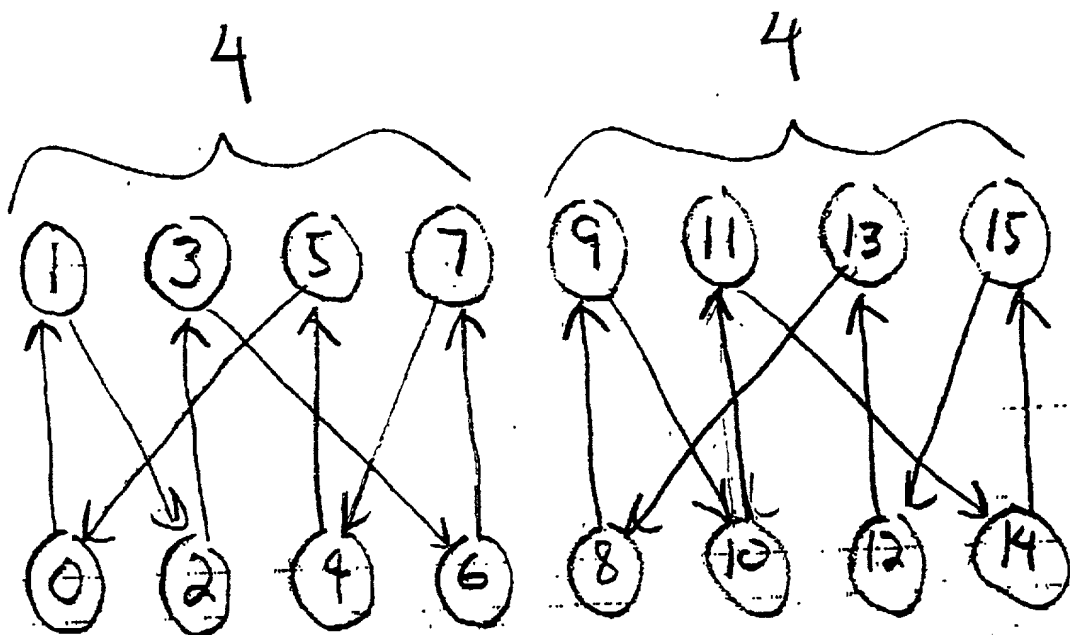


$(3, 3, 2)$ - disjoint
Figure 9(1)



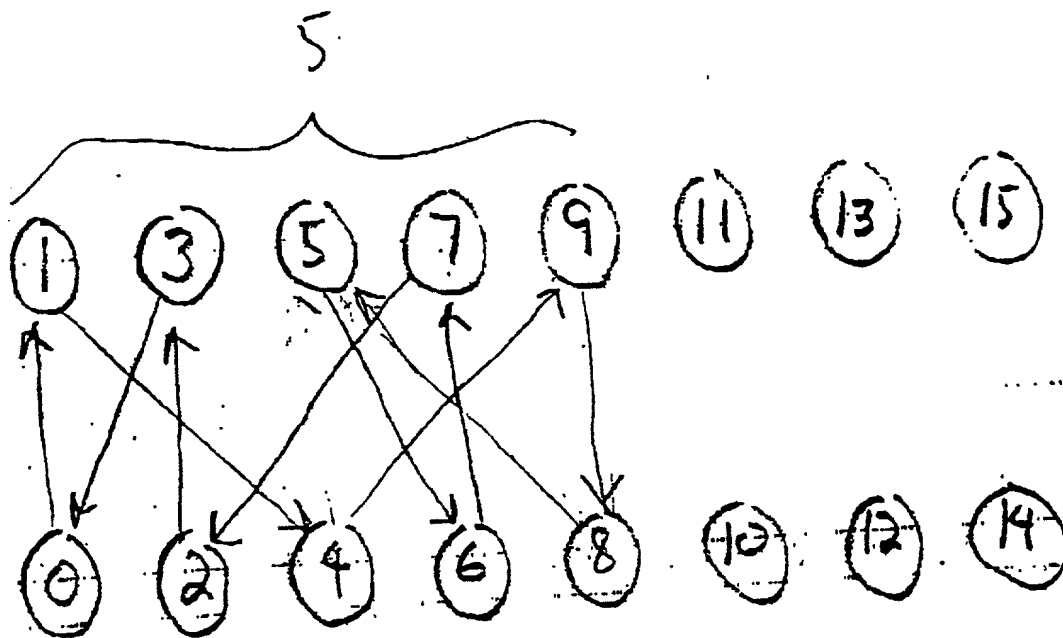
$(4, 2, 2)$ - 2-joint

Figure 9(c)



$(4,4)$ - disjoint

Fig. 9(b)



alternative for the 10-node ring for the
5-party conference implementation

in Fig. 9(e) for the $(5,3)$ -disjoint
implementation example

Fig. 9(e)

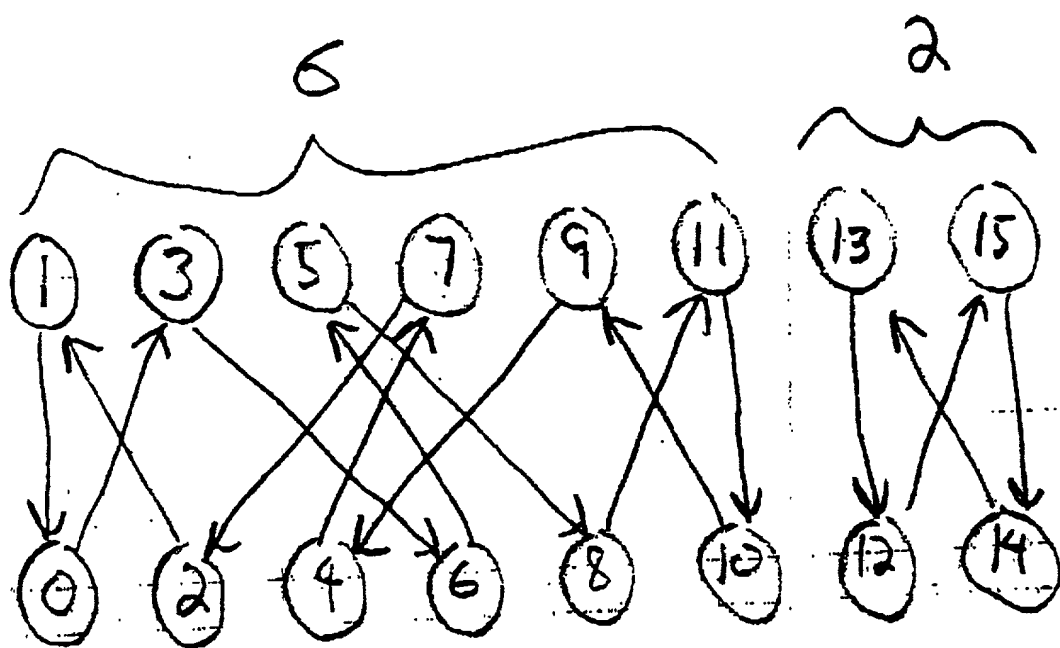
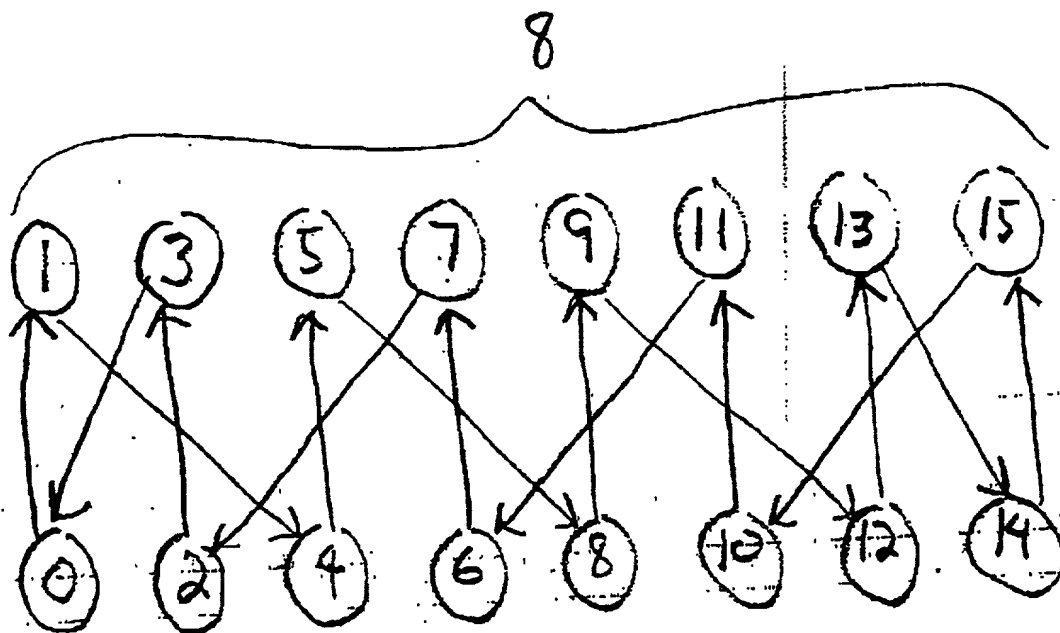
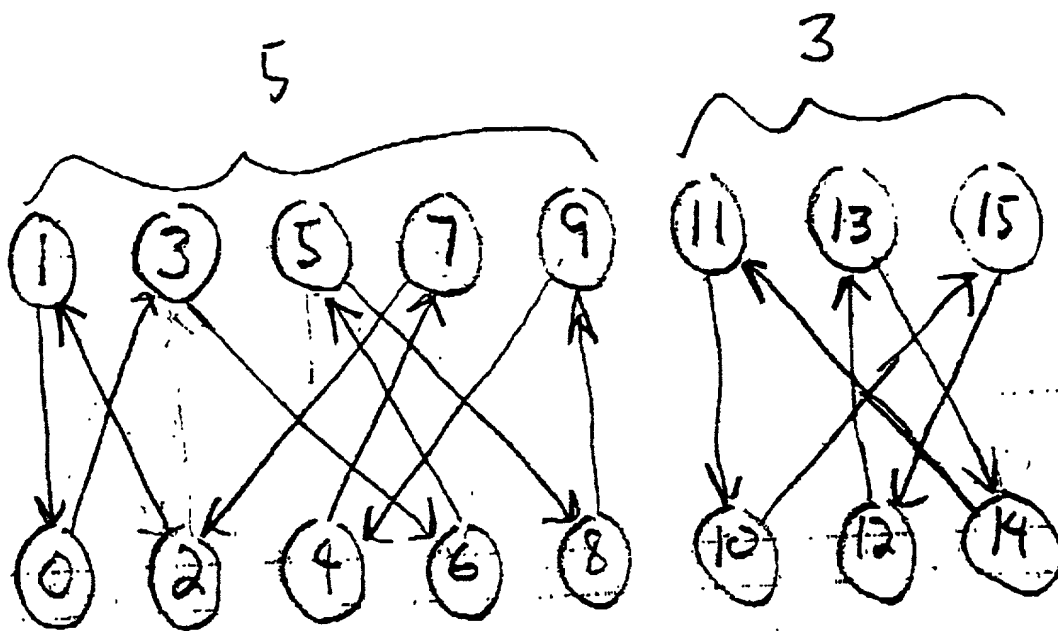


Fig. 9(f) (6, 2) - disjoint



(8) - disjoint

Fig. 9(g)



$(5, 3)$ -disjoint
Fig. 9 (#)

0 1 2 3 4 5 6 7
 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31

0	1	2	3	4	5	6	7
1	X	X	0	0			0
2	X	X	0	0			0
3	0	X	X	0			0
4	0	X	X	0			0
5	0	0	X	X	0		0
6	0	0	X	X	0		0
7	0	0	0	X	X	0	0
8	0	0	0	X	X	0	0
9	0	0	0	0	X	X	0
10	0	0	0	0	X	X	0
11	0	0	0	0	0	X	X
12	0	0	0	0	0	X	X
13	0	0	0	0	0	0	X
14	0	0	0	0	0	0	X
15	0	0	0	0	0	0	X
16	0	0	0	0	0	0	X
17	0	0	0	0	0	0	X
18	0	0	0	0	0	0	X
19	0	0	0	0	0	0	X
20	0	0	0	0	0	0	X
21	0	0	0	0	0	0	X
22	0	0	0	0	0	0	X
23	0	0	0	0	0	0	X
24	0	0	0	0	0	0	X
25	0	0	0	0	0	0	X
26	0	0	0	0	0	0	X
27	0	0	0	0	0	0	X
28	0	0	0	0	0	0	X
29	0	0	0	0	0	0	X
30	0	0	0	0	0	0	X
31	0	0	0	0	0	0	X

The "X" indicates core ring links

The "0" indicates spanning ring links

3) node CX ring with only twisted spanning links

Note that 0-ring (even node-to-even node) links are not shown

Note that 1-ring (odd node-to-odd node) links are not shown

Figure 10

	1	3	5	7	9	11	13	15
0		$1, 3, (x, \phi)$	$-1, 3, (x, \phi)$					
2	$1, 3, (x, \phi)$	$-1, 3, (x, \phi)$						
4	$-1, 3, (x, \phi)$		$1, 5, (x, y)$	$-1, 2, (y, \phi)$				
6				$1, 2, (y, \phi)$		$-1, 2, (y, \phi)$		
8			$1, 2, (y, \phi)$			$1, 2, (y, \phi)$		
10					$-1, 3, (z, \phi)$			$(-1, 3, (z, \phi))$
12					$(1, 3, (z, \phi))$		$-1, 3, (z, \phi)$	
14							$1, 3, (z, \phi)$	$-1, 3, (z, \phi)$

$$e(i, j) = (D_{1, j}, load_{1, j}, conf_assign(i, j) = (primary(i, j), pass_thru(i, j)))$$

Figure 11

	1	3	5	7	9	11	13	15
0		$1, x$	$1, x$					
2	$-1, x$	$1, x$						
4	$1, x$		$-1, x$					
6				$-1, y$		$1, y$		
8					$1, y$	$-1, y$		
10				$1, y$	$-1, y$			
12							$-1, z$	$1, z$
14							$1, z$	$-1, z$

Figure 12

0	2	4	6	8	10	12	14
ϕ, x_3, ϕ	ϕ, x_2, ϕ	ϕ, x_1, γ	ϕ, γ_1, ϕ	ϕ, γ_2, ϕ	ϕ, z_2, ϕ	ϕ, z_3, ϕ	ϕ, z_1, ϕ

1	3	5	7	9	11	13	15
ϕ, x_1, ϕ	ϕ, x_3, ϕ	ϕ, x_2, γ	ϕ, γ_1, ϕ	ϕ, z_1, ϕ	ϕ, γ_2, ϕ	ϕ, z_2, ϕ	ϕ, z_3, ϕ

Node-assignment(i) = ($in(i)$, $out(i)$, pass-thru(i))

Figure 13

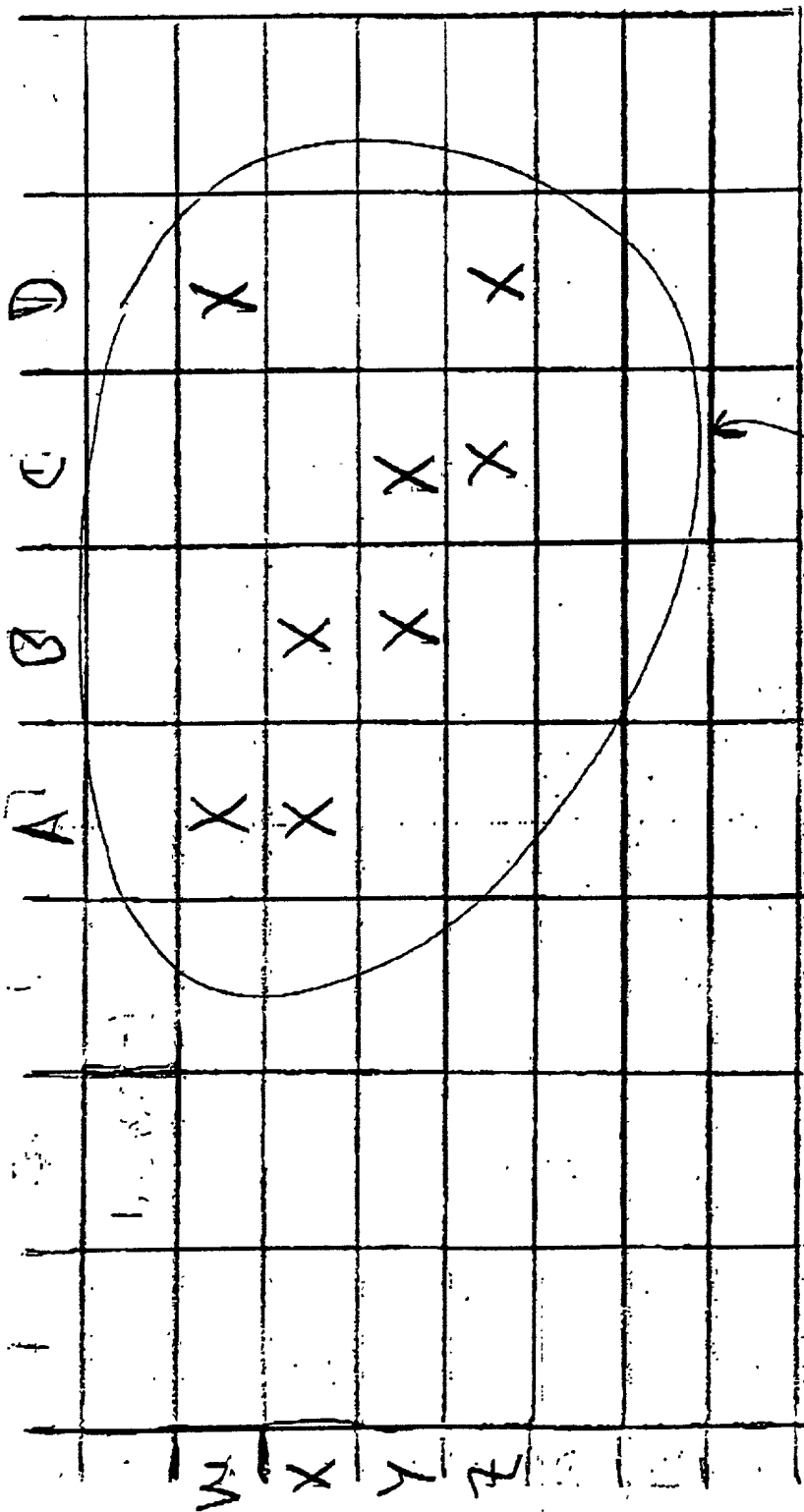


Figure 14(a)

Generic 8 node ring
in a link indication matrix

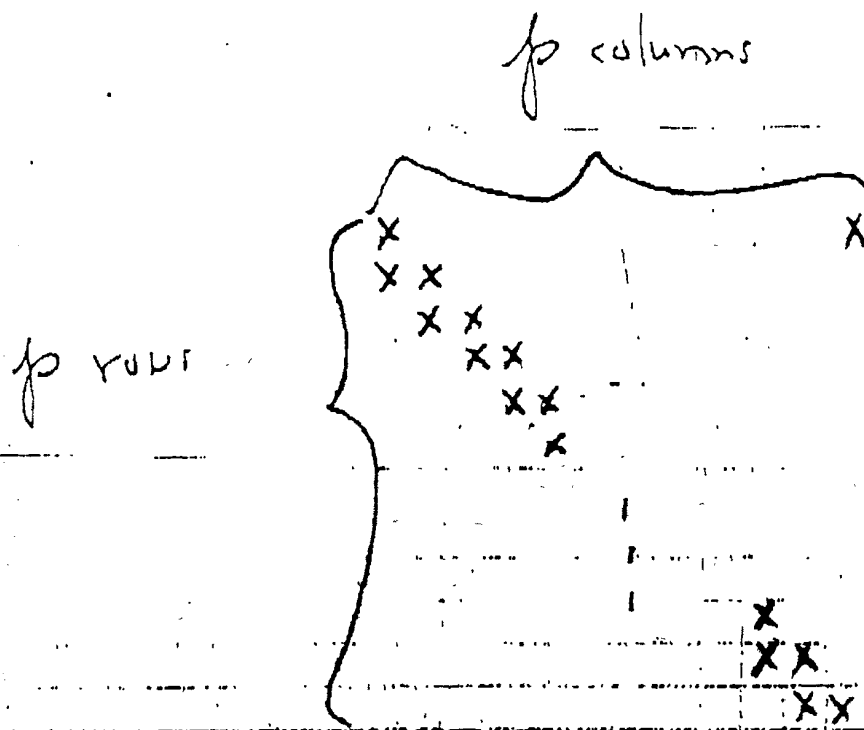


Figure 14(b)
 Generic 2 p node ring structure
 is a link indicator matrix

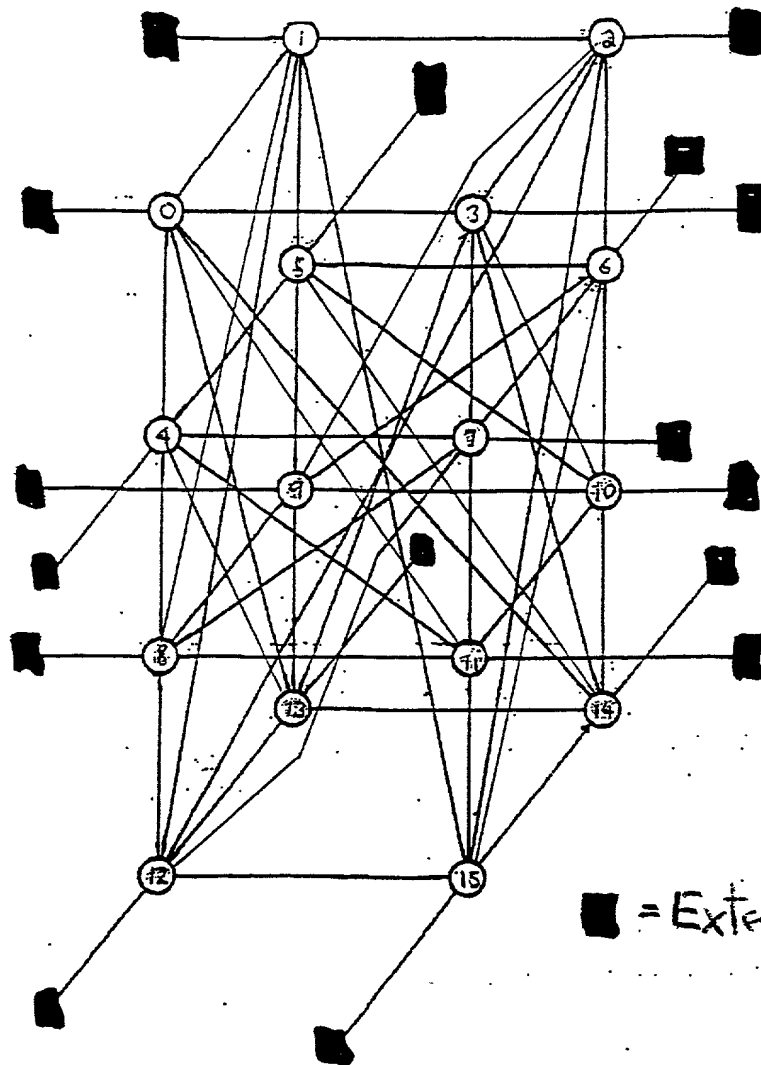


FIG
15

■ = External device

FIG
16 a

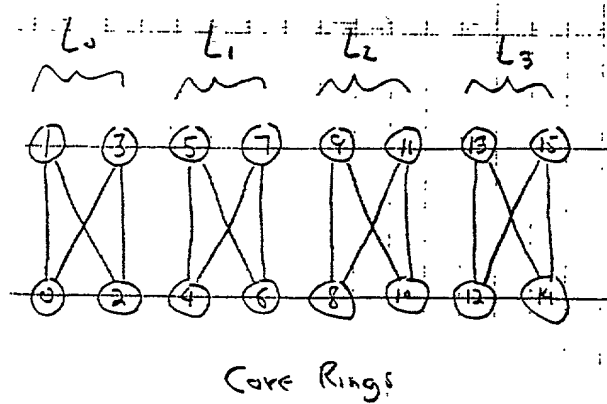


FIG
16 b

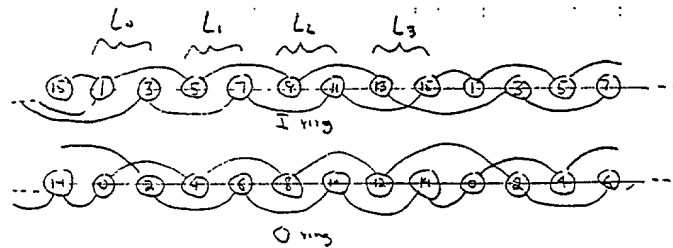
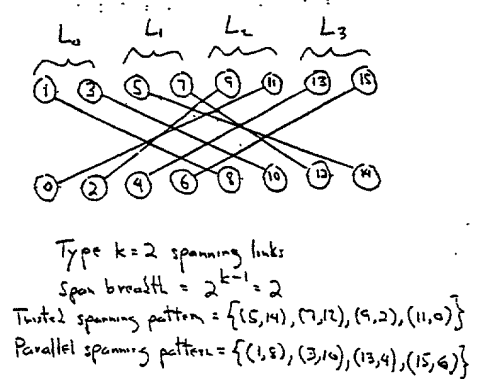
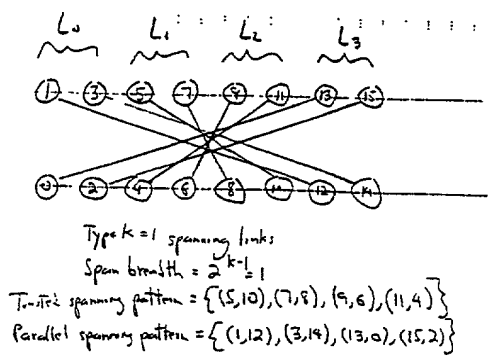


FIG
16
c



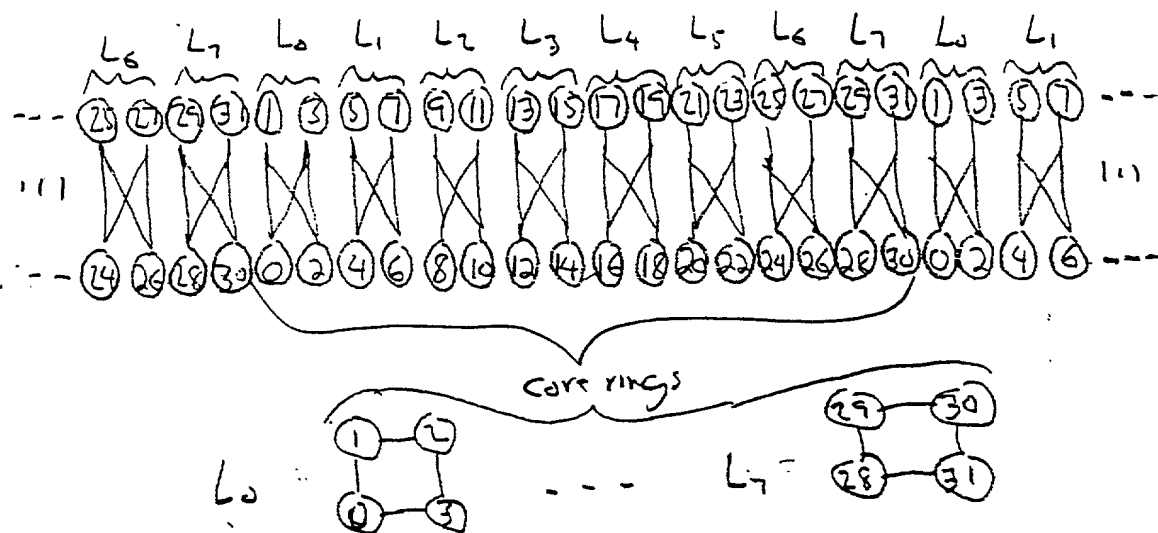


FIG
17

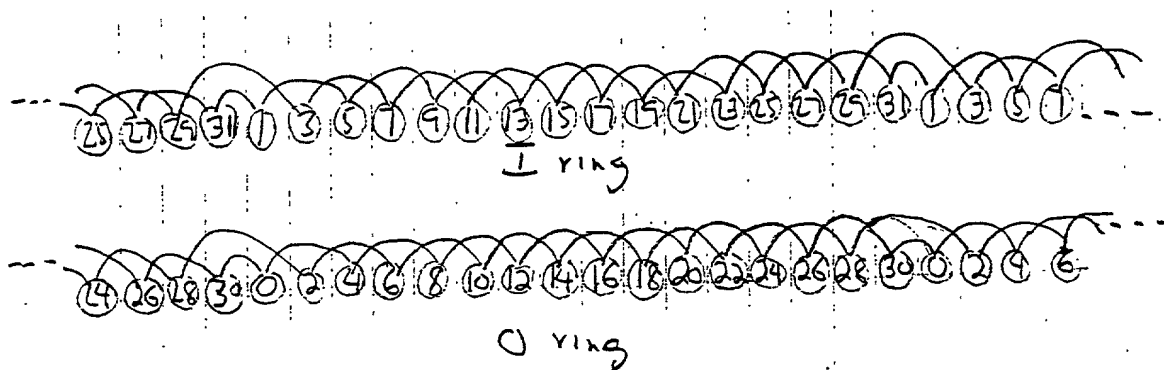


FIG 18

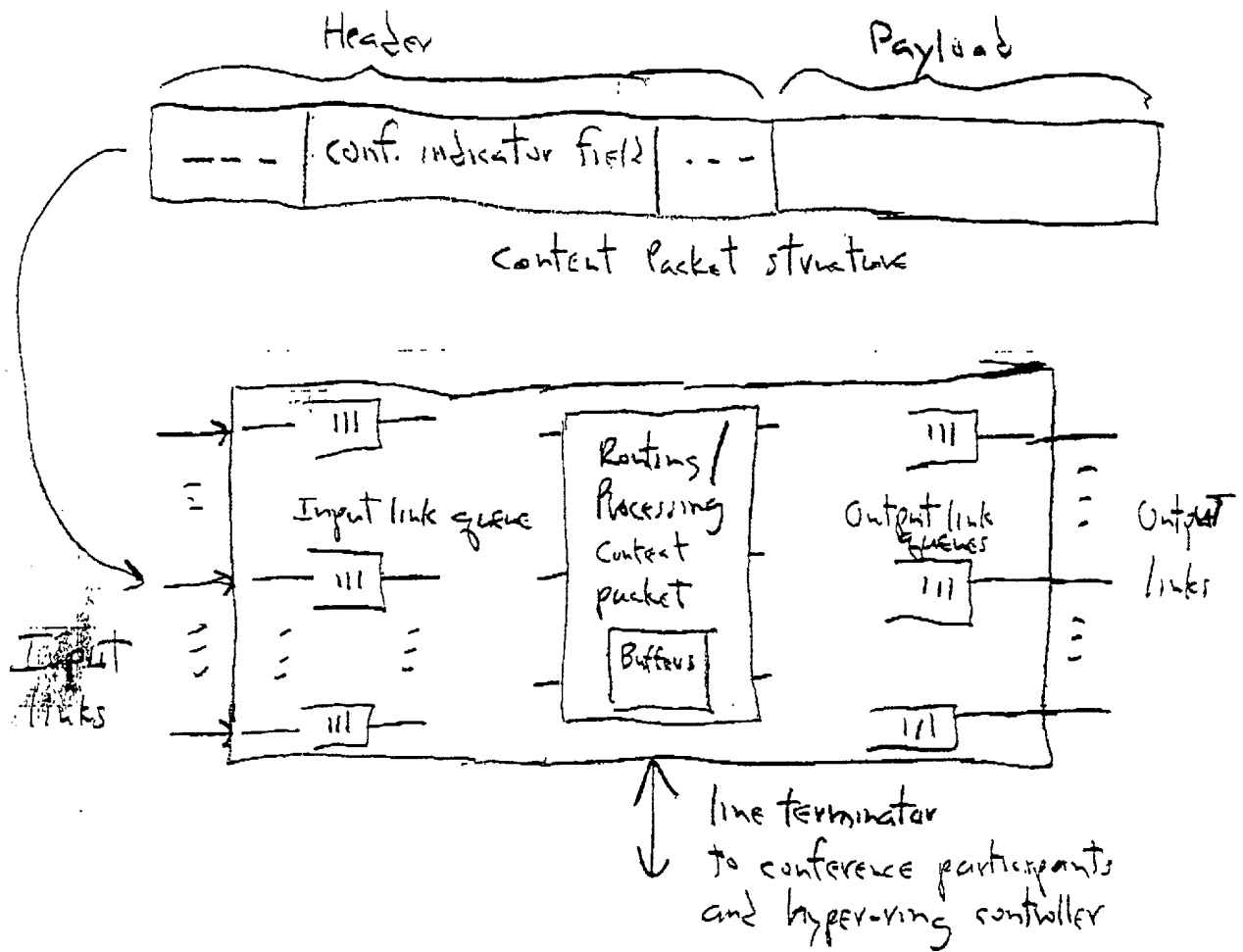
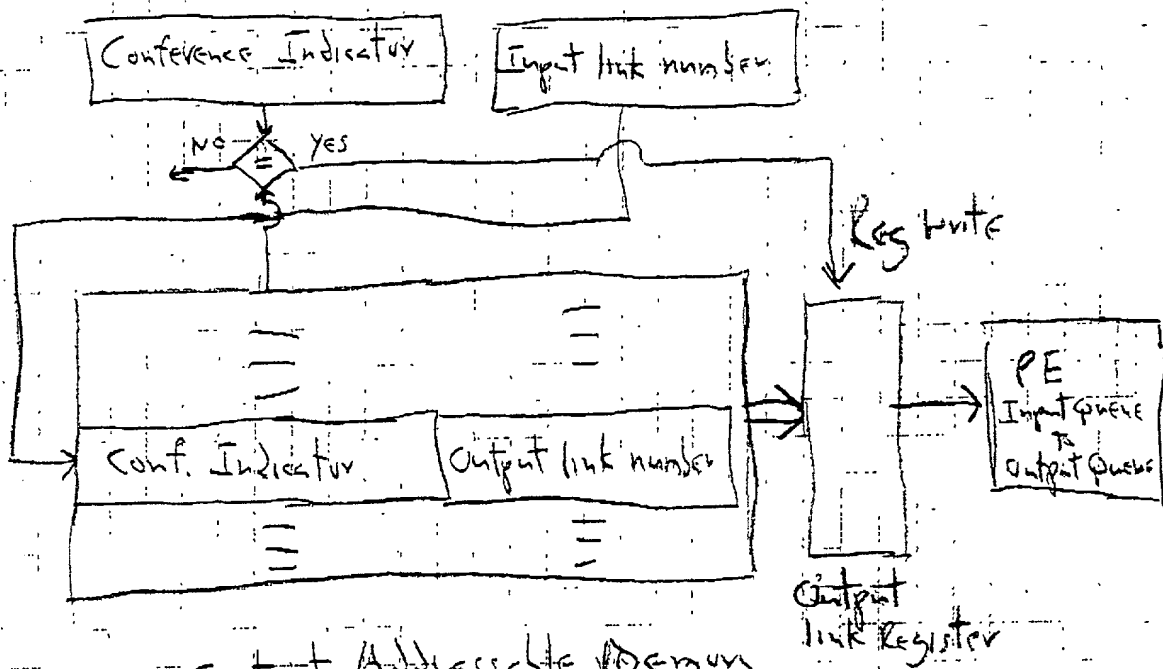


Figure 19



Content Addressable Memory

Figure 20

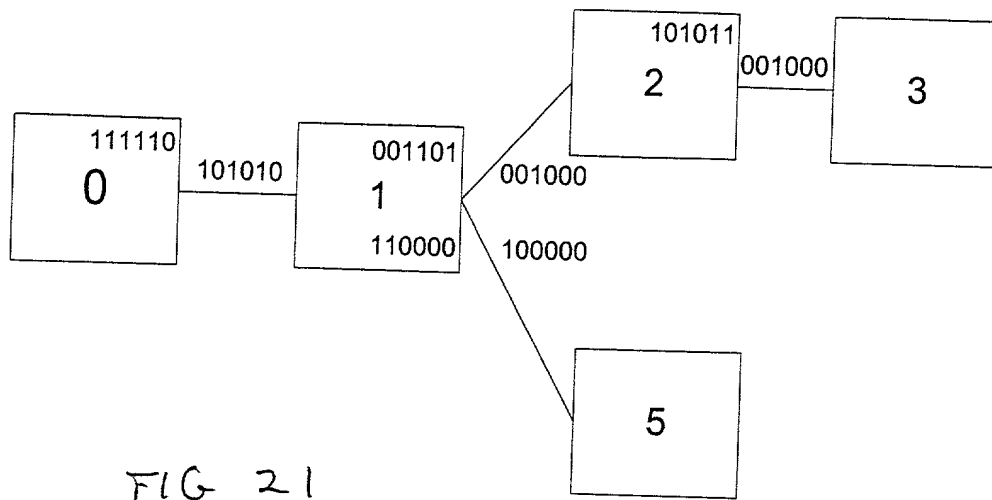


FIG 21

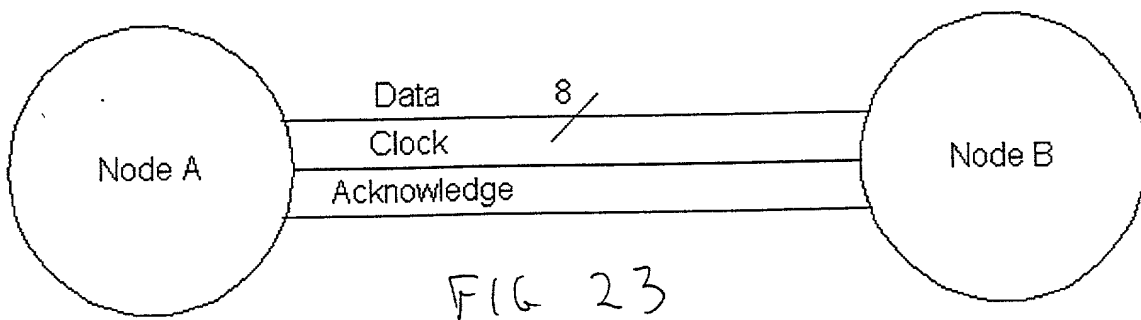


FIG 23

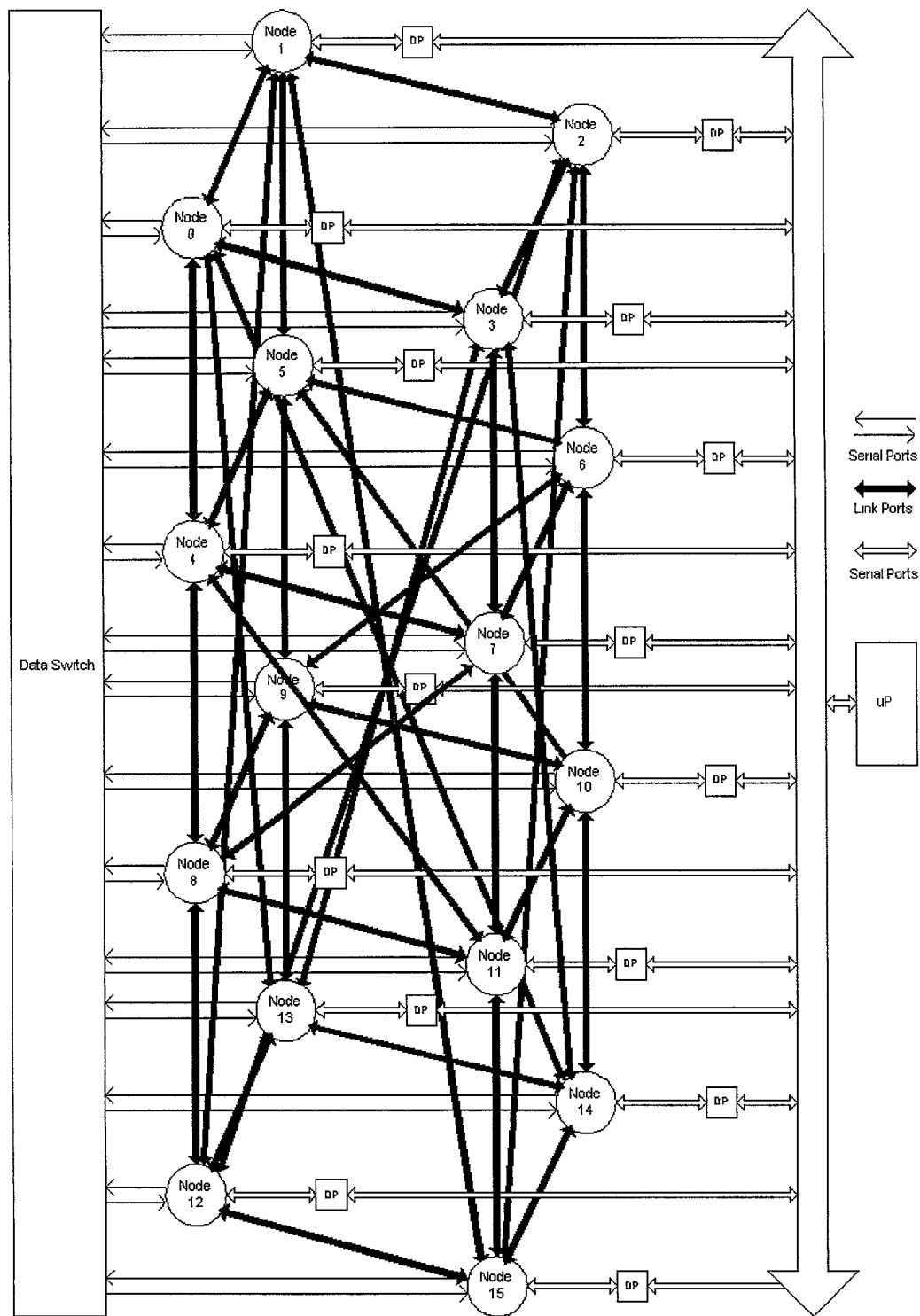


FIG 22

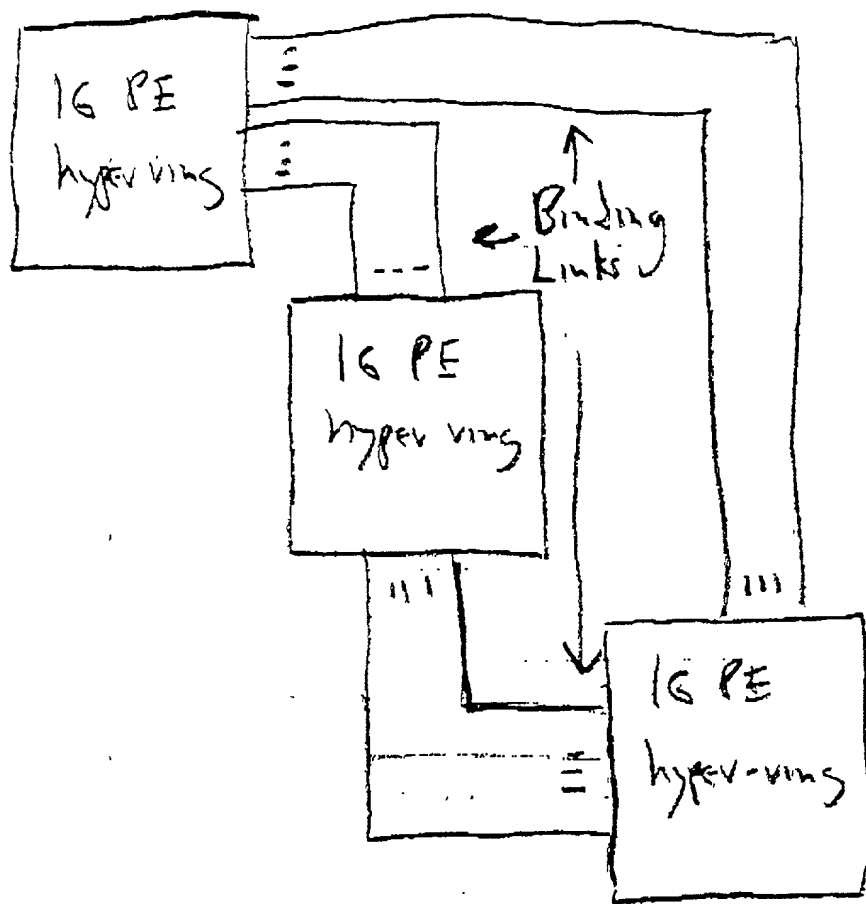


Figure 24